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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,789	03/26/2004	Wei Gao	SLA0837	5215

55286 7590 09/10/2008

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EXAMINER	
ARANCIBIA, MAUREEN GRAMAGLIA	
ART UNIT	**PAPER NUMBER**
1792	
MAIL DATE	**DELIVERY MODE**
09/10/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/813,789	GAO ET AL.	
	Examiner	Art Unit	
	Maureen G. Arancibia	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-6,8-13 and 15-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-6,8-13 and 15-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3, 6, 11, 17-19, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication 2003/0157211 to Tsunetomo et al. in view of U.S. Patent 6,994,808 to Lee et al.

In regards to Claims 1 and 21, Tsunetomo teaches a method of forming a microlens structure (a method of making an aspherical lens or lens array). (Tsunetomo, Paragraph 43). In accordance with the first step of claim 1, Tsunetomo provides a transparent material (additive-free transparent SiO_2 material layer 26). (Tsunetomo, Paragraphs 71 and 78). Tsunetomo also teaches forming a hard mask overlying the transparent material of the second step of claim 1 (providing a fluoridated SiO_2 layer 28 overlying the transparent SiO_2 layer 26). (Tsunetomo, Paragraph 71 and Figure 8A). Tsunetomo also teaches patterning an opening in the hard mask (adding a Cr-mask over the fluoridated SiO_2 layer 28 and etching the fluoridated SiO_2 layer 28 via the Cr-mask). (Tsunetomo, Paragraph 72 and Figure 8D). In accordance with the claimed forming step of claim 1, the etching is an isotropic wet etching (using aqueous hydrofluoric acid to etch isotropically). (Tsunetomo, Paragraphs 46, 72 and 91, and Figures 8C and 8D).

As required by Claims 1 and 21, Tsunetomo teaches that the hard mask etches faster than the transparent material (the fluoridated SiO_2 layer 28 etches faster than the additive-free SiO_2 layer 26). (Tsunetomo, Paragraphs 47 and 48 and Figure 1). As further required by the forming step, Tsunetomo also teaches that the hard mask is etched laterally to expose a larger area of the underlying transparent layer as the etch proceeds (i.e., the fluoridated SiO_2 layer 28 is etched laterally exposing a larger area of the additive-free SiO_2 layer 26 as the etch proceeds). (Tsunetomo, Figures 8C and 8D). Finally, as required by the removing step of Claims 1 and 21, Tsunetomo teaches removing the hard mask (i.e., the fluoridated SiO_2 layer 28 is etched away, thus completely removing the fluoridated SiO_2 layer 28). (Tsunetomo, Paragraph 72 and Figure 8E)

Further in regards to Claims 1 and 21, Tsunetomo does not expressly teach that the lens material is selected from a group consisting of HfO_2, TiO_2, ZrO_2, and ZnO_2.

Lee teaches an alternative method for forming a microlens (Col 1, Lines 11-20), in which the lens material can be selected to be HfO_2, TiO_2, or ZrO_2. (Column 6, Lines 12-19)

It would have been *prima facie* obvious to one of ordinary skill in the art to select one of HfO_2, TiO_2, or ZrO_2 as the lens material in the method of Tsunetomo, as art-recognized suitable materials for the intended purpose, as taught by Lee. (Column 6, Lines 12-19)

In regards to Claim 3, Tsunetomo teaches that the transparent material is SiO_2.

In regards to Claim 6, in the combination of Tsunetomo and Lee, the lens material has a higher refractive index than the transparent material. Specifically, the transparent material, which is made of silica, has a refractive index of 1.457 (Tsunetomo, Paragraph 54), while the lens material of HfO_2, TiO_2, or ZrO_2 has a refractive index greater than 2.0 (Lee, Column 6, Lines 12-19).

In regards to Claim 11, the combination of Tsunetomo and Lee discussed above does not expressly teach planarizing the lens material.

However, Lee additionally teaches a step of planarizing the lens material (by polishing). (Column 5, Lines 17-26; Column 6, Lines 22-26)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Tsunetomo and Lee to additionally include a step of planarizing the lens material, as taught by Lee. The motivation for making such a modification would have been to ensure that the high refractive lens material remains only in the lens cavity, and to prepare the uneven deposited surface of the lens material for any further processing.

In regards to Claim 17, Tsunetomo teaches that the opening in the hard mask 28 has non-vertical walls. (Figure 8C)

In regards to Claims 18 and 19, the combination of Tsunetomo and Lee discussed above in regards to Claim 1 does not expressly teach that does not expressly teach that the method further comprises providing a second transparent material overlying the transparent material and below the hard mask, and having a faster etch rate than the transparent material.

However, Tsunetomo additionally teaches in an alternative embodiment that a transparent layer 20 to be etched can comprise a plurality of layers of transparent material, each formed of silicon oxide doped with a different amount of fluorine, such that each layer has a faster etch rate than the layer below it (Figure 6). (Paragraphs 29, 61, 62)

It would have been obvious to one of ordinary skill in the art to further modify the method taught by the combination of Tsunetomo and Lee to form the transparent material to be etched of a plurality of layers of transparent material (thus comprising at least a second transparent material), each layer formed of silicon oxide doped with a different amount of fluorine, such that each layer has a faster etch rate than the layer below it, as taught by Tsunetomo et al. The motivation for doing so, as taught by Tsunetomo et al. (Paragraphs 49 and 64), would have been to provide stepwise control over the etch rate at increasing depth, which one of ordinary skill in the art would recognize as giving increased control over the exact shape of the asymmetrical lens cavity.

3. Claims 4, 8-10, 13, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunetomo et al. in view of Lee et al. as applied to Claims 1 and 21 above, and further in view of U.S. Patent 6,781,762 to Ozawa.

The teachings of Tsunetomo and Lee were discussed above in regards to Claims 1 and 21.

In regards to Claim 4, the combination of Tsunetomo and Lee does not expressly teach that the transparent material may be an optical resin.

Ozawa teaches, in an alternative method of forming a microlens, that a transparent material 210a to be etched more slowly than a layer 220' above it can suitably be formed of an optical resin. (Figures 12a-12f; Column 3, Lines 40-41; Column 14, Line 46 - Column 15, Line 65)

It would have been obvious to one of ordinary skill in the art to alternatively use an optical resin as the transparent material in the method of Tsunetomo and Lee, as an art-recognized suitable material for the intended purpose of providing a transparent layer in the manufacture of a microlens, as taught by Ozawa (see at least Column 3, Lines 40-41).

In regards to Claims 8-10, the combination of Tsunetomo and Lee does not expressly teach forming a single layer AR coating comprising glass overlying the lens material.

Ozawa teaches, in a method of forming a microlens, a step of forming a single layer coating 200 of quartz glass overlying the lens material, as broadly recited in the claim. (*cover glass 200*; Figure 12f; Column 16, Lines 1-3)

It would have been obvious to one of ordinary skill in the art to alternatively include a step of forming a single layer coating of glass overlying the lens material, as taught by Ozawa, in the method taught by the combination of Tsunetomo and Lee, for the predictable result of covering and protecting the lens material.

The cover glass layer taught by the combination of Tsunetomo, Lee, and Ozawa inherently meets the recitation of an AR (anti-reflective) coating, due to having a refractive index between that of the high-refractive-index lens material and that of air

(which has by definition a refractive index of 1). Examiner cites Applicant's Specification (Page 7, Lines 22-27) as evidence that a glass layer would inherently serve as an AR coating.

In regards to Claim 13, the combination of Tsunetomo and Lee does not expressly teach that planarizing the lens material comprises reflowing the lens material.

Ozawa teaches, in an alternative method of forming a microlens, planarizing the lens material 230 by reflowing the lens material, as broadly recited in the claim. (the lens material is planarized when it is pressed by cover glass 200; Figure 12f; Paragraph 25)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Tsunetomo and Lee to alternatively perform the planarizing the lens material by reflowing the lens material, as taught by Ozawa, for the predictable result of smoothing and planarizing the lens material without any fear of scratching caused by polishing.

In regards to Claim 20, the combination of Tsunetomo and Lee does not expressly teach that the substrate 10 on which the transparent layer 26 is provided has a photodector formed thereon.

Ozawa teaches, in an alternative method of forming a microlens, that a substrate 10 on which a transparent layer 210a is provided can have a photodetector 9a formed thereon. (Figure 11; Column 13, Lines 59-63)

It would have been obvious to one of ordinary skill in the art to modify the method of Tsunetomo and Lee to use a base substrate having a photodetector formed thereon,

as taught by Ozawa. The motivation for making such a modification, as taught by Ozawa (Column 13, Lines 59-67), would have been to use the light collected by the microlens in an electrooptic device.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunetomo et al. in view of Lee et al. as applied to Claim 1 above, and further in view of U.S. Patent 6,890,450 to Naydenkov et al.

The teachings of Tsunetomo and Lee were discussed above in regards to Claims 1 and 21.

In regards to Claim 5, Tsunetomo teaches that the isotropic wet etch can be an HF etch. (Paragraph 72)

The combination of Tsunetomo and Lee does not expressly teach that the HF etch can be a buffered HF etch.

Naydenkov et al. teaches using a buffered HF etch to etch oxide. (Column 5, Lines 47-60)

It would have been obvious to one of ordinary skill in the art to alternatively use a buffered HF etch in the method taught by the combination of Tsunetomo and Lee, as taught by Naydenkov et al., for the predictable result of performing a more controllable etch step.

5. **Claims 12 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunetomo in view of Lee as applied to Claims 1 and 11 above, and further in view of U.S. Patent 6,211,916 to Hawkins et al.**

The teachings of Tsunetomo and Lee were discussed above in regards to Claims 1 and 11.

In regards to Claim 12, the combination of Tsunetomo and Lee does not expressly teach that planarizing the lens material comprises chemical mechanical polishing.

Hawkins et al. teaches an alternative method of planarizing a lens material 130, comprising chemical mechanical polishing. (Column 5, Lines 25-26)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Tsunetomo and Lee to alternatively perform the planarizing the lens material by chemical mechanical polishing, as taught by Hawkins et al., for the predictable result of planarizing the lens material optically flat.

In regards to Claim 16, Tsunetomo teaches that the hard mask 28 can be a doped silicon oxide and the transparent material can be undoped silicon oxide, as discussed in regards to Claim 1 above.

6. **Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunetomo in view of Lee as applied to Claim 1, and further in view of U.S. Patent 6,307, 243 to Rhodes and U.S. Patent Application Publication 2004/0082094 to Yamamoto.**

The teachings of Tsunetomo and Lee were discussed above. Tsunetomo further teaches that the silicon oxide hard mask 28 (which is a doped silicon oxide) and transparent material 26 can be formed by CVD. (Paragraph 71)

The combination of Tsunetomo and Lee does not expressly teach that the silicon oxide hard mask, formed by CVD, can be TEOS oxide.

Rhodes teaches that a silicon oxide layer 72 formed by CVD can be TEOS oxide (TEOS is used as the silicon source; Column 6, Lines 6-18)

It would have been obvious to one of ordinary skill in the art to modify the teachings of Tsunetomo and Lee to have the doped silicon oxide hard mask be formed as a TEOS oxide. The motivation for making such a modification, as taught by Rhodes (Column 6, Lines 6-18), would have been that using TEOS as the silicon source in a CVD process to form a silicon oxide layer results in improved conformal deposition.

The combination of Tsunetomo and Lee also does not expressly teach that the transparent material can be thermal oxide.

Yamamoto teaches that a transparent material 305 located below microlenses 313 can be thermal oxide. (Paragraph 23)

It would have been obvious to one of ordinary skill in the art to modify the teachings of Tsunetomo and Lee to form the transparent material of thermal oxide, as taught by Yamamoto. The motivation for doing so would have been to form the oxide by a blanket deposition. Moreover, it has been held that the selection of a known material based on its suitability for its intended use is *prima facie* obviousness.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571)272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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